


# The Practices are for Kids!

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*The Math Projects Journal*  
Temecula Valley USD

**Reason Abstractly and Quantitatively**



I contextualize and decontextualize problems.

**Contextualize**  
I put numbers and variables in a real-world context.

Given,  $M = 9h + 10$ ,  
I can say, "I have \$10 and earn \$9 an hour. The amount of money I make depends on the number of hours that I work."

**Decontextualize**  
I pull numbers and variables from context and work with them mathematically.

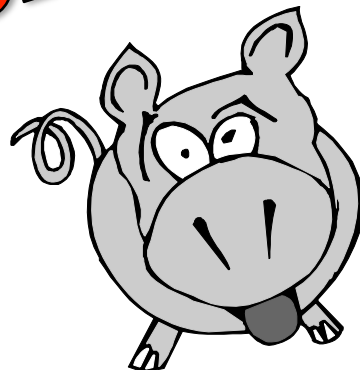
Given, "I have \$10 and earn \$9 an hour. How much money will I make?"  
I can write,  $M = 9h + 10$

What do these numbers and symbols represent?  
What does it mean when I manipulate this equation?  
What units am I dealing it?  
How do these quantities relate to each other?

**REASON**  
Contextualize  
Decontextualize  
Quantities  
Representations  
Properties

Think about numbers in many different ways

**Pig Pen Algebra and  
the SMPs!**



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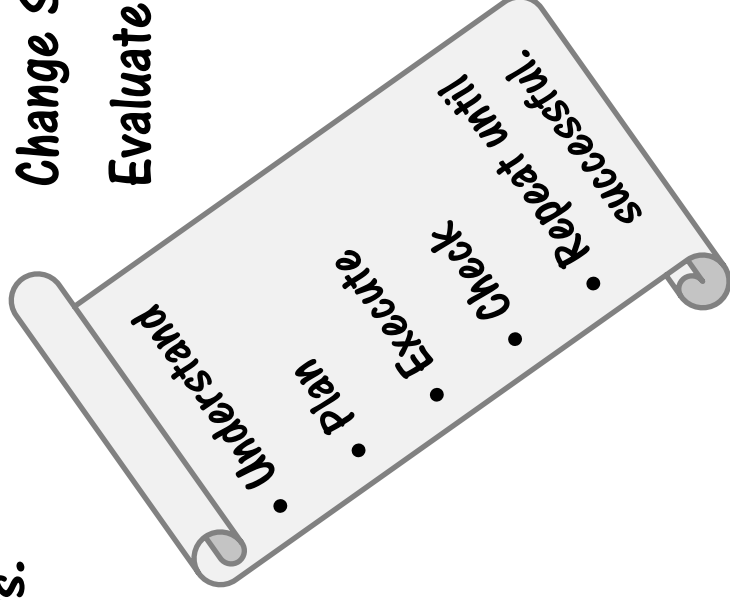
# Make Sense of Problems and Persevere in Solving Them



I can understand a problem, devise a strategy, execute a plan and evaluate its success.

## SOLVE

Organize  
Strategize  
Change Strategies  
Evaluate



What exactly is this problem asking of me?

What information do I have?

What information do I need and how do I get it?

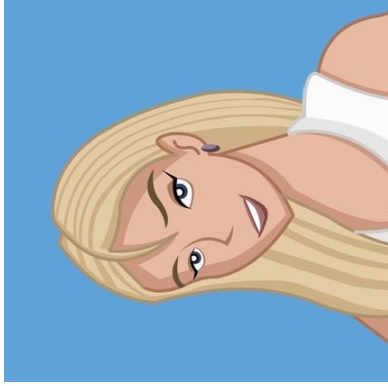
What is the best plan?

Is my answer reasonable?

If not, how should I change my strategy?

Think and don't give up.

# Reason Abstractly and Quantitatively



I contextualize and decontextualize problems.

## Contextualize

I put numbers and variables in a real-world context.

Given,  $M = 9h + 10$ ,

I can say, 'I have \$10 and earn \$9 an hour. The amount of money I make depends on the number of hours that I work.'

Contextualize

Decontextualize

Quantities

Representations

Properties

What do these numbers and symbols represent?

What does it mean when I manipulate this equation?

What units am I dealing with?

How do these quantities relate to each other?

## Decontextualize

I pull numbers and variables from context and work with them mathematically.

Given, 'I have \$10 and earn \$9 an hour.

How much money will I make?'

I can write,  $M = 9h + 10$

# REASON

Think about numbers in many different ways.

# Construct Viable Arguments and Critique the Reasoning of Others



I make and support conjectures, and critique the mathematical thinking of others.

Instance

$$x \cdot x = x^2$$

$$5 \cdot 5 = 5^2$$

$$25 = 25$$

How do I defend my answer?

Can that really be correct?

How do I show him that he is wrong?

How does she know that?

What objects, drawings, actions or context can I use to prove my point?

## CONJECTURE

Justify

Prove

Support

Explain

Analyze

Instance

Counterexample

Counterexample

$$x \cdot x \neq 2x$$

$$5 \cdot 5 \neq 2 \cdot 5$$

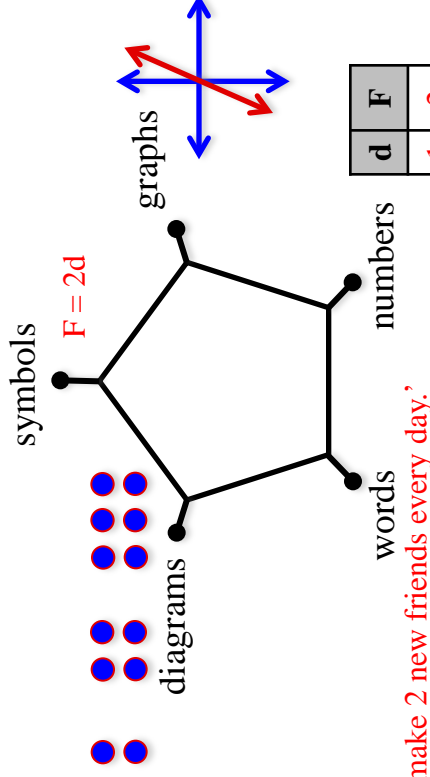
$$25 \neq 10$$

Explain your thinking convincingly.

# Model with Mathematics



I use math that I know to solve everyday problems.



d	F
1	2
2	4
3	6

Does my representation make sense?

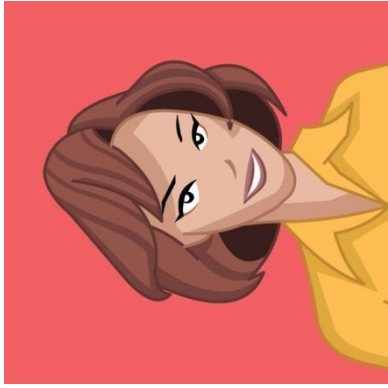
Which quantities share a relationship?

Which representation would make this problem easier?

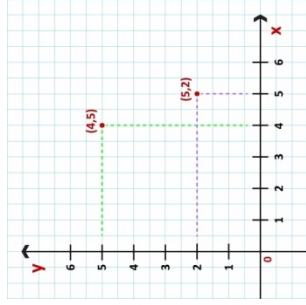
Think about your world in symbols, graphs, words, diagrams and numbers.

# MODEL

# Use Appropriate Tools Strategically



I know when to use certain tools to help me understand a relationship or scenario.



## TOOLS

Calculator

Computer

Ruler

Protractor

Compass

Graph

Watch

Number Line

Formula

Which tools will be most helpful?

Did my tool yield an answer close to my estimation?

What tools do I have available?

Do I need a calculator?

Think about which tools you should use.

# Attend to Precision



I determine and work towards  
the level of accuracy needed for  
a problem.

$\sqrt{2}$  or 1.4?

Do I need to round my answer?

To what place value should I round?

Is an estimate good enough, or do I need an exact value?

Did I label my answer?

Are my definitions clear?

What scale should I use on my axes?

## PRECISION

Accuracy

Efficiency

Exact

Approximate

Symbols

Definitions

Units

inches?

1.4 what? days?

dollars?

Think intentionally and thoroughly.



# Look For and Make Use of Structure



I see how one concept in mathematics is connected to others.

	10	5	
10	100	50	
3	30	15	

$$\begin{aligned}
 & (13)(15) \\
 &= (10 + 3)(10 + 5) \\
 &= 10(10) + 3(10) + 10(5) + 3(5) \\
 &= 100 + 30 + 50 + 15
 \end{aligned}$$

## STRUCTURE

Dimension

Transformations

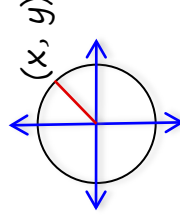
Base-10

Terms

Coefficients

Operations

Properties



$$x^2 + y^2 = r^2$$

Can I break this problem down into smaller ones?

Can I use what I know to solve new problems?

How is this concept similar to one that I already know?



$$a^2 + b^2 = c^2$$

Think about how well math fits together.

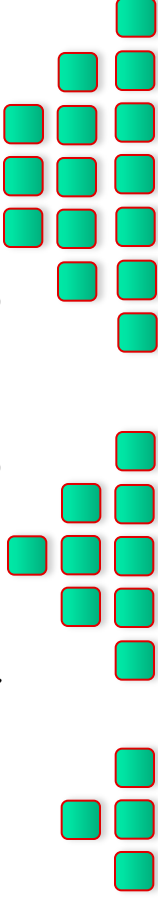


# Look For and Express Regularity in Repeated Reasoning



I notice when data or shapes are repeated and can use that pattern to make predictions.

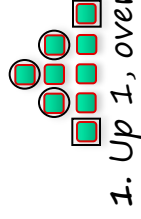
How do you see this pattern growing?



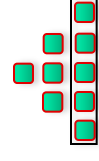
Is there a pattern here?

How can I generalize this pattern?

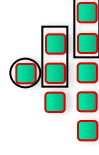
Can I predict a specific case of this pattern?



1. Up 1, over 2



2. 2 more than previous row



3. 2 more each row, and one on top

Think about patterns & predictions.

## PATTERNS

Generalization

Numbers

Shapes

Structure

Case

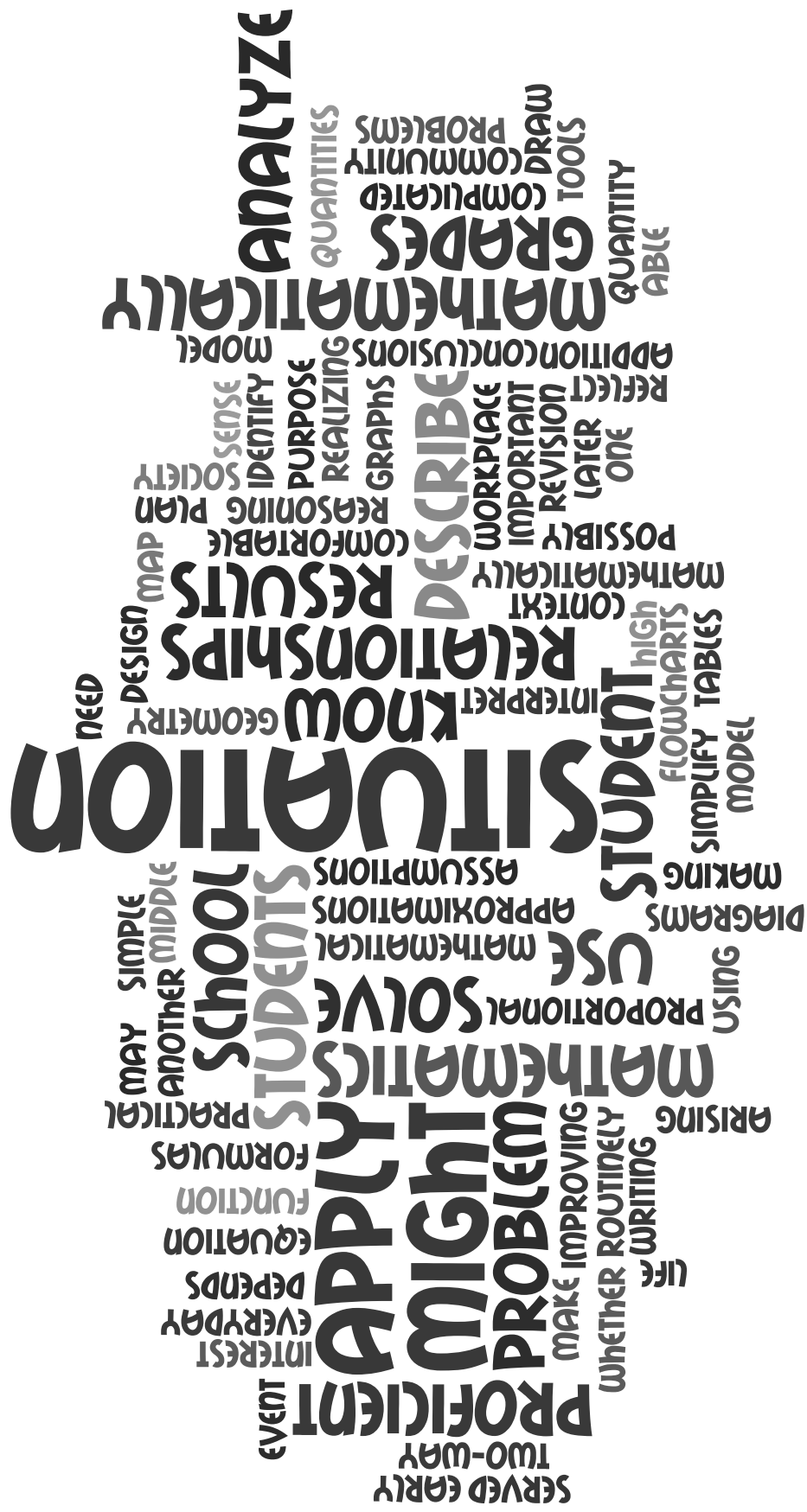
Prediction

sense units make bear  
properties represent habits involving two  
needed quantitative different meanings students  
process ability order situations quantitative  
referents necessarily decontextualize  
complementary Reason involved problems  
quantities relationships probe flexibly  
quantitatively Mathematically given symbols  
representing manipulation  
contextualize symbolically proficient representation  
compute considering operations abstractly  
creating manipulate knowing hand reasoning  
just entails abilities abstract without  
life bring using

[illegible]

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students  
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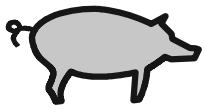


students definitions  
try precision  
problem use  
others  
make including clear  
labeling meaning efficiently  
state reach explicit measure choose Attend  
communicates correspondences specifying axes formulated  
answers time units accurately  
grades calculate express degree  
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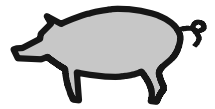


Mathematically proficient strategically explore appropriate students tools  
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mathematically relevant protractor levels sufficiently problems computer concepts sound  
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solving Proficient helpful available insight  
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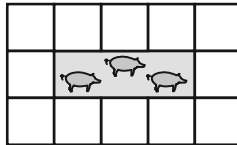
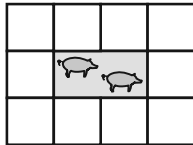
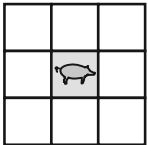
VIEWING INSIGHT MAKE  
ASK PATHWAY RELY SEARCH ANSWERS GAIN  
MAKE CHANGE IMPORTANT CONSIDER  
PROBLEM PROFICIENT DATA EQUATIONS CASES  
PROBLEMS USING  
STUDENTS APPROACHES TRY MIGHT IDENTIFY CONCEPTUALIZED DESCRIPTIONS  
SOLUTION MATHS DIFFERENT RELATIONSHIPS  
SOLVING MATHEMATICALLY CONJECTURES ALGEBRAIC PERSEVERE  
COURSE SENSE CORRESPONDENCES PICTURES START ENTRY SPECIAL WINDOW  
TABLES INFORMATION REGULARITY PROGRESS YOUNGER ORIGINAL FORM  
SOLVE UNDERSTAND GRAPH EVALUATE JUMPING OTHERS TRENDS METHOD  
TRANSFORM GRAPHING SIMPLER EXPLAIN FORMS CHECK PLAN  
GOALS ORDER FORMS CHECK PLAN  
VERBAL GIVENS GET  
POINTS OBJECTS  
CONTEXT NEED  
DRAW  
OLDER  
MONITOR  
ANALOGOUS  
CONCRETE  
EXPLAINING  
NECESSARY  
PERSEVERE  
CONCRETE  
DEPENDENT RATHER  
ENTRY SPECIAL WINDOW  
SIMPLY GRAPHS



# Pig Pen Algebra



Farmer John is making a pig pen. He is short on materials so he is making the pen out of bales of hay. These bales are shaped as cubes. Farmer John likes to keep things simple, so whenever he gets another pig, he just extends the pen as shown below. Your job is to help Farmer John write a formula to tell him how many bales of hay he will need for a given number of pigs.

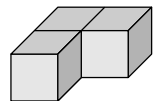


- How would you move the existing bales to make room for another pig?
- In the space above, draw pens that would hold 4 and 5 pigs respectively.
- How many bales of hay must be added to an existing pen, to make room for the next pig?
- Without anymore drawings, complete the chart below for P number of pigs and B number of bales.

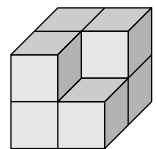
P (pigs)	1	2	3	4	5	6	7	8	9	10	20	50
B (bales)	8	10	12									

- How did you figure out your answers for 20 and 50 pigs?
- According to the pattern in the chart, how many bales would you predict are needed for no pigs?

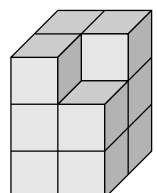
- Write an equation that represents the number of bales B needed to pen P number of pigs.



- Show how to use your new equation to find how many bales are needed for 100 pigs.



- How many pigs could be penned by 96 bales of hay?



## ASSIGNMENT

A tower is built up as shown on the right. Write an equation that represents the number of blocks T needed to build a tower S stories tall.

